

tion—including, not only secondary schools, but also the instruction of pupil-teachers—the training of teachers, the provision of scholarships, evening schools or the various forms of technical instruction, and higher education in science and in art generally. A diagram has been introduced into the Blue-book this year showing graphically, for three years, including 1906-7, the comparative rise and fall of certain selected items of expenditure, other than out of loans, of local authorities for classified groups of areas. The income from all sources for meeting the year's expenditure showed a total increase, as compared with the previous year, 1905-6, of nearly 213,000*l.*, and the increased amount raised from rates was equivalent to about 97 per cent. of that total. The total expenditure on higher education, as already defined, was, during the year, 3,680,718*l.*, as compared with 3,355,434*l.* in the previous year. In 1906-7 the expenditure under various headings was as follows:—for secondary education, 1,068,655*l.*; for evening schools and institutions for higher and technical education, 1,475,358*l.*; for exhibitions, including scholarships, bursaries, and the payment of fees, 448,769*l.*; for training of teachers other than pupil-teachers, 98,599*l.* In addition to these items, administrative and legal expenses accounted for 198,073*l.*, other expenses amounted to 120,320*l.*, and 220,480*l.* was paid in respect of loans.

THE thirty-sixth annual dinner of the "Old Students" of the Royal School of Mines was held on March 30, under the chairmanship of Mr. F. W. Rudler, supported by many distinguished guests and old School of Mines men, as well as old students of the Royal College of Chemistry and Royal College of Science. The "Royal School of Mines" was proposed by Sir William H. White, who referred to the admirable record of the school and to the intention of the governing body that its reincarnation should render it second to none in the world. Mr. Rudler, in replying, referred to the early history of the school and to the necessity for combining theory with practice on the lines which had been laid down in drawing up the plans for the new laboratories and testing floors, and expressed the hope that it might be possible to found a chair of economic geology. The toast of "The Visitors," proposed by Mr. Bedford McNeill, was responded to by Mr. A. H. Dyke Acland, who pointed out that "character and grit," as well as the admirable training in the reorganised Royal School of Mines, are essential to a student's success. In concluding, Mr. Acland referred to the proposed students' union building, which he hopes will worthily represent the governors' desire for the bodily and mental welfare of the students, both of the Royal School of Mines and of the other colleges, &c., connected with the Imperial College of Science and Technology. In replying to the toast of "The Chairman," Mr. Rudler referred to the loss sustained by the mining and metallurgical professions by the death of Bennett H. Brough. Provision for the widow and children has been made by the Iron and Steel Institute, and it is now proposed to invite subscriptions for an entirely different purpose, which is for the formation of some permanent memorial to perpetuate the memory of one who was widely honoured and loved. Notices will be sent out shortly with the view of the foundation of a scholarship at the Royal School of Mines. All who knew Brough will agree that such a scholarship is the very thing which he would have desired, and that a more fitting occasion could not have been chosen for this—the first official announcement of what had been in the minds of so many since the death of their old friend.

## SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society.** January 21.—"The Photo-electric Fatigue of Zinc.—II." By H. Stanley **Allen**. Communicated by Prof. H. A. Wilson, F.R.S.

In a former paper (Roy. Soc. Proc., A, vol. lxxviii., p. 483, 1907) an account was given of the way in which the photo-electric activity of zinc diminishes when the metal is exposed to light from a Nernst lamp.

The experiments described in the present paper were

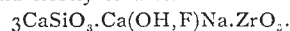
carried out to determine whether the results were similar when using a source of light giving far more ultra-violet radiation than the Nernst lamp. A mercury-vapour lamp of fused quartz was employed.

The method of experimenting was similar to that described in the previous paper, but the testing cell, consisting of the zinc plate and a positively charged sheet of wire gauze, was in the open air instead of being enclosed in a brass case.

**Conclusion.**—The photo-electric activity of a zinc plate decays in such a way that it can be represented as the sum of two exponential terms. The constants of change are but little altered by considerable variations in the character and intensity of the illumination employed, though the value of the photo-electric current is changed considerably. The rate at which the surface is altered is not greatly affected by using a mercury-vapour lamp in place of a Nernst lamp.

**Royal Microscopical Society,** March 17.—Mr. E. J. Spitta, vice-president, in the chair.—The optical examination of a crystal section in a rock slice: Dr. J. W. **Evans**.—*Synchaeta fennica*, sp.n., and on the resting-egg of *S. pectinata*: C. F. **Rousselet**.

**Mineralogical Society,** March 23.—Principal H. A. Miers, F.R.S., president, in the chair.—A stage goniometer for use with the Dick pattern of microscope: Prof. H. L. **Bowman**. The form of goniometer, intended to be screwed to the stage of a microscope with rotating Nicols, which was designed by Principal Miers, has been slightly modified by the author with the view of securing increased rigidity and ease of control. The instrument is adapted for supporting and manipulating a small crystal during the examination of etching-figures or other features requiring high magnification, as well as for the determination of its optic axial angle in air or oil, and the extinction angles and other optical characters of the various faces. It is provided with screw motions for adjusting and centring the crystal, and for regulating the height of the axis above the stage.—The electrostatic separation of minerals: T. **Cook**. Conductivity is a much more important factor than specific gravity in determining the behaviour of mineral fragments under the influence of an electrostatic charge. The greater susceptibility of good conductors as compared with bad conductors can be made still more pronounced by providing for the escape of the repelled opposite charge, which takes place rapidly in good conductors and slowly in bad conductors. It was shown that, in consequence of this fact, grains of such good conductors as ilmenite, pyrites, galena, or wolfram can be easily separated by means of a rubbed piece of sealing-wax from admixed grains of bad conductors, such as calcite, quartz, fluor, or monazite. Minerals having a metallic lustre are good conductors, whereas those which are colourless and highly transparent are bad conductors. It is suggested that there is probably a much closer connection between the conductivity of a mineral and its general optical properties than has been hitherto suspected.—The identity of guarinite and hiortdahlite: Dr. F. **Zambonini**, with chemical analysis by Dr. G. T. **Prior**. The rare mineral guarinite, which occurs sparingly in small yellow crystals in the sanidine bombs of Monte Somma, has been hitherto regarded as orthorhombic, and as essentially a complex silicate of lime, alumina, and soda. A new investigation made by the author on crystals showing terminal faces shows that the mineral is really triclinic, and identical both crystallographically and optically with hiortdahlite. Crystals of guarinite show polysynthetic twin lamellæ with oblique extinctions like those exhibited by crystals of hiortdahlite. The chemical analysis showed that the mineral is essentially a fluo-silicate and zirconate of lime and soda, practically identical in composition with hiortdahlite, although the percentage of fluorine was lower than that given in Cleve's analysis of the latter mineral. The numbers obtained in the analysis correspond closely to a formula



—Note to a paper on the comparison of refractive indices of minerals in thin sections: Dr. J. W. **Evans**. Parallel Nicols are placed so as to bisect the angle between the

directions of vibration in the adjoining crystal sections which make the smaller angle with each other, so that the Becke effect is mainly due to the relation between their indices of refraction. The author discusses in detail the effect of the refractive indices of the different directions of vibration on the result.

**Geological Society**, March 24.—Prof. W. J. Sollas, F.R.S., president, in the chair.—Glacial erosion in North Wales: Prof. W. M. Davis. An excursion around Snowdon in 1907, followed by another in 1908, led the author to think that a large-featured, full-bodied mountain of pre-Glacial time had been converted by glacial erosion during the Glacial period into the sharp-featured, narrow-spurred mountain of to-day. The indifference of topographic form to the trend of formation boundaries and the inequent stream arrangement are what might be expected as the result of prolonged erosion upon a mass of complicated and resistant structure. The author is of opinion that the upland deserves classification rather with peneplains; he suggests for it a Tertiary date, and argues that Snowdon had a relief of some 2000 feet above the plain. It is considered that the dissection of North Wales must have been less developed in pre-Glacial times than in Devon to-day. On this assumption it is possible to make a tentative restoration of the pre-Glacial form of Snowdon. The chief abnormal features of Snowdon are the following:—Alongside the summit and slopes of a "moel" stand the head-cliffs of a rock-walled cwm, in the floor of which talus is accumulating. The cwm-floors are generally stepped, and the streams cascade down into the valleys. The slope of the main valleys occasionally decreases even to the point of reversal, as where lakes occur, and in the immediate neighbourhood of smoothly graded, waste-covered slopes, knobby or craggy ledges and bars of rock often appear. Two out of four possible hypotheses put forward are discussed—"that glaciers are essentially protective agencies" or that they "are active destructive agencies." It is found that certain facts, and especially those relating to rock-steps, cannot be explained on the protection theory, while the theory of a destructive agency seems to explain most of the facts. There is no systematic relationship between the height of the cwm-cliffs and the distance of the front rock-step; the serration of "cribs" or *arêtes* cannot be explained by pre-Glacial or post-Glacial weathering, according to the protection theory. No consistent explanation of the valley-steps can be found under the theory of ice protection, whereas they are explicable on the assumption of glacial erosion. The catenary curve of the cross-section of such valleys as those containing Llyn Gwynant and Llyn Cwellin might be expected to result from long-continued ice erosion, and the occurrence of great cliffs on the sides of these valleys is not inconsistent with such an origin. The most striking case of a glacial overflow is that at the head of the Nantlle valley, which appears to have carried much of the west Snowdon ice. The head of the pass would seem to have been farther westward and higher in pre-Glacial times.

## DUBLIN.

**Royal Dublin Society**, March 23.—Prof. A. F. Dixon in the chair.—Black scab or potato-wart (*Chrysophlyctis endobiotica*, Schilb.), and other Chytridiaceæ: Prof. T. Johnson. The author gave an illustrated account of the origin, structure, and conditions of germination of the multispore resting sporangia of the parasitic fungus *Chrysophlyctis endobiotica*, Schilb., the cause of black scab or black wart in potatoes. The successful germination of the "resting spores" was announced in a letter to NATURE in November, 1908. The author, basing his observations on the examination of type-material from M. Trabut, compared beet-tumour, due to *Urophlyctis* or *Cladochytrium leproides*, with potato-wart, and showed how they differ. He also discussed Magnus's views on the genus *Urophlyctis*, and stated that flax yellowing caused by *Asterocystis radialis*, de Wild., not uncommon in Ireland a few years ago, is now kept in check by potash manuring. *Eurychasma Dicksonii* (Wright), Magnus, and *Olpidium sphacellarum*, Kny, two Irish marine Chytridiaceæ, the latter being hitherto unrecorded for Ireland, were described.

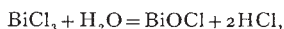
The Scandinavian origin of the hornless cattle of the British Isles: Prof. James Wilson. The common opinion is that the British hornless breeds of cattle originated either as reversions to an older hornless type or as spontaneous variations, as Darwin believed, from the horned to the hornless condition. Both these theories are wrong, for these reasons:—(a) the self-same variation occurred in too many places—twelve or fifteen at least—in Britain; (b) it ought to have occurred as frequently among similar cattle elsewhere, in the Low Countries, for instance; and (c) it has ceased to occur within what might be called bovine historic time. The first suggestion that the British hornless cattle are of Scandinavian origin comes from the localities in which they were found in the eighteenth century. These were what might be called pockets round the coasts of Britain and in Ireland, viz. Suffolk, Holderness, Forfarshire, Aberdeenshire, Morayshire, Sutherland, Skye, Galloway, Somerset, Devon, and the north and west of Ireland. Besides being hornless, these coast cattle agreed in several other characteristics—they were light dun in colour, or bore colours derived from light dun; they were small, narrow chined, short legged, sickle-hocked, and good dairy cattle. They arrived in Britain before 1066, and not before the end of the Anglo-Saxon invasion. Cattle of the same kind were found in other Norse settlements, viz. Normandy, the Channel Islands, north Holland, Orkney, Shetland, and Iceland, and cattle of the same kind are still to be found from Norway to north Russia. In all probability they are descended from the cattle of the Scythians, referred to by Herodotus, and may be traced back either to Egypt or western Asia.—The osmotic pressures of the blood and eggs of birds: W. R. G. Atkins. The blood of *Gallus bankiva*, *Meleagris gallopavo*, Anas, Anser, and *Rhea americana* was examined, and the freezing point of the blood of each species was found to be almost constant, the variations being of the same order as those met with in mammals. The eggs of *Gallus* and *Anas* were studied; they are not isotonic with the blood, freezing at  $-0^{\circ}.45$  C., while the blood freezes at  $-0^{\circ}.61$  C. and  $-0^{\circ}.57$  C. respectively. This difference in the freezing point is more than accounted for by the diminution in inorganic salts in the egg as compared with the blood.

## PARIS.

**Academy of Sciences**, March 29.—M. Bouchard in the chair.—Complement and summary of the observations made at Meudon Observatory on Morehouse's comet: H. Deslandres, A. Bernard, and J. Bosler. After summarising the work which has been done on this comet, the following are mentioned as noteworthy points:—the presence of three new lines or bands ( $\lambda\lambda$  456, 426, and 401) of unknown origin, noticed for the first time in the tail of Daniel's comet; the presence of only one group of cyanogen bands; and the presence of a characteristic nitrogen band.—The diffraction of Hertzian waves: H. Poincaré. A mathematical investigation which throws light on the striking effects of diffraction obtained in wireless telegraphy over great distances.—Some extremely simple formulæ relating to the coefficient of self-induction and to the time constant of a very long bobbin: Marcel Deprez. The formula given for the coefficient of self-induction is  $L^2/a$ , in which  $L$  is the total length of wire wound on the bobbin, and  $a$  the length of the bobbin.—Concerning *Trypanosoma pecaudi*, *T. dimorphon*, and *T. congolense*: A. Laveran. Two sheep inoculated with *Tr. pecaudi* became infected; at the end of six months they were cured, and were completely immune against this organism. Inoculated then with *T. dimorphon*, they were infected like new animals. One of these, after cure, had not acquired immunity against *T. dimorphon*, but the other proved to be immune. The latter animal, then inoculated with *T. congolense*, contracted the infection. All these observations confirm the original view that these three trypanosomes belong to entirely independent species.—M. Boudier was elected a correspondent in the section of botany in the place of the late M. Masters.—Certain cyclic systems: G. Tzitzéica.—A general principle of uniformisation: Paul Koebe.—An arrangement for measuring very small displacements of the lines of



the spectrum: H. **Buisson** and Ch. **Fabry**.—The hydrolytic dissociation of chloride of bismuth: René **Dubrisay**. If the equation usually given for dissociation,



the solution should be divariant at constant pressure; from thermochemical data an elevation of temperature ought to correspond with a diminution in the degree of dissociation. Both these conclusions have been experimentally confirmed.—The calculation of molecular weights by means of vapour densities. The case of toluene: A. **Leduc**. The author has applied the formulæ developed by him in previous papers to the experimental data of Ramsay and Steele for toluene vapour. The molecular weight thus deduced is 92.083, as against 92.088 deduced from the atomic weights, the difference being less than the experimental error. The method of reduction used by Ramsay and Steele gave a result nearly 0.5 per cent. different from this.—The radioactivity of the thermal springs of Bagnères-de-Luchon: Charles **Moureau** and Adolphe **Lepape**. The radioactivities of the gases given off spontaneously by the waters, and those of the waters themselves, have been determined. It is noteworthy that, in spite of the close analogy in composition and geological origin of these twenty springs, the radioactivities found are very unequal, and cannot be connected with any other physical or chemical property of the waters.—The impossibility of predicting by thermochemistry the relative stability of comparable compounds of lead and silver: Albert **Colson**. A study of the comparative stability of the carbonates and nitrates of lead and silver. The results obtained do not correspond with the heats of formation of these salts.—The preparation of some new silicon chlorides of the silicemethane series: A. **Besson** and L. **Fournier**. When the silent discharge is passed through a mixture of silicon-chloroform and hydrogen a reaction takes place, an oily liquid being deposited. From this the authors were able to isolate  $\text{SiCl}_4$ ,  $\text{Si}_2\text{Cl}_6$ ,  $\text{Si}_3\text{Cl}_8$ , all of which have been previously described. In addition to these, two new compounds are obtained, possessing the composition  $\text{Si}_5\text{Cl}_{12}$  and  $\text{Si}_6\text{Cl}_{14}$ . The method of preparation ensures the complete absence of oxychlorides.—The purification of hydrated sulphuric acid from arsenic by freezing: M. **Morancé**. A crude acid was partially frozen, the crystals formed being about one-half the weight of the acid employed. The percentages of iron and arsenic in the solidified acid were much less than in the original sample.—The colouring and tinctorial properties of picric acid: Léo **Vignon**. The coloration of solutions of picric acid in various solvents varies in the same sense as the electrical conductivity of these solutions.—The condensation of methyl-diketobutyrate with hydrocarbons and with aromatic amines: A. **Guyot** and V. **Badonnel**. This ester undergoes condensation readily with dimethylaniline, diethylaniline, and toluene. The chief properties and reactions of the compounds thus made are given.—Allylcarbinol. Passage to the furfuran series: H. **Pariselle**. An improved method of preparing this compound from magnesium, trioxymethylene, and allyl bromide is described. The addition of bromine to the allylcarbinol gives



and this, under the action of caustic potash, gives monobrom-tetrahydrofurfuran.—The cyclisation of the acyclic diketones: E. E. **Blaise** and A. **Koehler**.—The hybrids of barley and the law of Mendel: L. **Blaringhem**.—The natural immunity of snakes against the venom of batrachians, and in particular against salamandrine: Mme. M. **Phisalix**.—The incoagulability of the blood resulting from the ablation of the liver in the frog: M. **Doyon** and Cl. **Gautier**.—A method of coloration of the myelin of the peripheral nerve fibres, and on certain analogies between the microchemical reactions of myelin and mitochondria: Cl. **Regaud**.—Proof of the presence of *Treponema pallidum* in the cephalorachidian liquid arising from acquired syphilis of the nervous centres: E. **Gaucher** and Pierre **Merle**.—The therapeutical activity of d'Arsonvalisation: E. **Doumer**.—General experimental infection with hepatic localisation: A. **Le Play**.—Orientation in certain molluscs: Georges **Bohn**.—Cochineal of

the south of France and Corsica: Paul **Marchal**.—A new genus of Zeinæ: A. **Cligny**.—The composition of the Lower Eocene in the south and centre of Tunis and Algeria: J. **Roussel**.—The Cretaceous escarpment of the S.W. of the Paris basin: Jules **Welsch**.—The age of the Primary limestones of the eastern Pyrenees: O. **Mengel**.—The Upper Cretaceous of the basin of Seybouse (Algeria): J. **Blayac**.—Analysis of the Arctic submarine deposits: J. **Thoulet**.—Lithological study of the deposits of the pool of Thau: L. **Sudry**.

## DIARY OF SOCIETIES.

FRIDAY, APRIL 16.

MALACOLOGICAL SOCIETY, at 8.—Description of *Pomatias Harmieri*, n.sp., from the Red Crag of Essex: A. S. Kennard.—Fossil Pearl Growths: J. Wilfred Jackson.—The New Zealand Athoracophoridae, with Descriptions of Two New Forms: Henry Suter.—On the Family Ampullariidae, No. 1, Ampullarina (*sensu stricto*), List of Species, Varieties, and Synonyms, with Descriptions of New Forms: G. B. Sowerby.

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